

Review Article

Using Artificial Intelligence Applications in Detecting and Diagnosing Mild Cognitive Impairment and Dementia

Virginia Lee^{1*}

¹LCSW R PsyD Student at Walden and CHE Behavioral Health Services and Independent Licensed Clinical Social Worker, USA

***Correspondence author:** Virginia Lee, LCSW R PsyD Student at Walden and CHE Behavioral Health Services and Independent Licensed Clinical Social Worker, USA; Email: vleeLCSW@gmail.com

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Abstract

Millions of Americans are at risk of developing dementia, but proactive detection could be delayed. Your lifestyle factors, physical health and cognition can predict dementia for up to two decades before dementia symptoms. The 2024 International Working Group Lexicon defines terminology for Alzheimer's disease, presymptomatic Alzheimer's disease and Alzheimer's as crucial. Using Artificial Intelligence to detect dementia: Computerized Cognitive Screening, Iot, Cloud Computing, Edge Computing, Internet of Medical Things, Virtual Reality and Neuropsychological Assessment, Facial dementia screening, Microbleed detection: Object detection, Chatbot: Natural language processing and MemoryCareAI. Lifestyle changes can mitigate modifiable risk factors.

Methods: Using literature reviews of Artificial Intelligence for Cognitive Health Assessment: State-of-the-Art, Open Challenges and Future Directions, Applications of artificial intelligence in dementia, Applications of artificial intelligence in dementia research. Applications of Artificial Intelligence in the Neuropsychological Assessment of Dementia: A Systematic Review. Alzheimer's Disease as a Clinical-Biological Construct- An International Working Group Recommendation and Studies identify strong predictors for dementia that may aid early diagnosis.

Keywords: Alzheimer's Disease; Chatbot; Cloud Computing; Dementia

Introduction

According to the Alzheimer's Association, a leading voluntary health organization in Alzheimer's care, support and research, by 2050, the number of AD patients is expected to rise to 13.8 million. Having poor physical health, experiencing a stroke, Having high-risk genes that

predict future risk of developing cognitive impairment and dementia, not having a private health insurance plan at age 60, never having worked only a few years, having diabetes or a Body Mass Index (BMI) of 35 at age 60, never drinking alcohol or drinking excessively, never exercising, scoring low on grip strength, walking speed and balance, being less conscientious, low engagement in hobbies that involve learning new things [1].

The overall cost of care in 2019 is about \$290 billion. In recent years, Artificial Intelligence (AI) and Machine Learning (ML) have become progressively more important in early detection, preventive measures and treatment.

The 2024 International Working Group Lexicon Uses the Following Terms:

Asymptomatic at Risk for Alzheimer's Disease (AD)

Cognitively normal individuals are at increased risk of developing cognitive impairment due to undetermined risks associated with a biomarker profile. The biomarker profile corresponds to brain amyloidosis, either isolated or associated with tauopathy to the medial temporal regions or tau(p-tau) fluid biomarker [2].

Presymptomatic AD

Cognitively normal individuals with a specific pattern of biomarkers are associated with a very high lifetime risk of progression. Examples are highly penetrant autosomal dominant genetic variations associated with a close to 100% lifetime risk of AD. APP, PSEN1 and PSEN2 [2].

People affected by Down syndrome. Persons with APOE e4 allele 4 with SORL1 loss of function. Parental age is an additional factor. Sporadic AD pathology biomarker changes with a high lifetime risk of AD, such as amyloid Positron Emission Tomography (PET)+ with tau PET (+) in neocortical regions [2].

Cognitively Impaired Individuals with Specific Clinical Phenotypes

Positivity of cerebrospinal fluid or PET pathophysiological AD biomarkers. Plasma biomarkers such as p-tau 217 may be routine workups. This includes the prodromal (mild cognitive impairment and no loss of function) and dementia (loss of function) stages [2].

Using AI

Computerized Cognitive Screening: The neuropsychological tests include the Abbreviated Mental Test, the Montreal Cognitive Assessment (MoCA), the Mini-Mental State Examination (MMSE) and other mobile apps, making more available to patients, caregivers and healthcare providers [3].

The screening tools are divided into three categories: 1: Apps based on a single medical assessment such as MMSE and MoCA; 2: Apps based on multiple medical assessment methods, such as DementiaTest, which is a six-item cognitive impairment and the structured clinical interview; 3: Apps based on nonverbal methods, such as Cognity, which applies screen for AD by combining analysis of a clock photo drawing by the user and the MMSE [3].

Artificial Intelligence IoT: The purpose of using IoT is to assess people's mental health and provide immediate care and treatment. Privacy, security, data analysis and internet connection interruption are some challenges in using IoT [4].

Cloud Computing: Cloud computing is an emerging technology due to complete access, automation backups and disaster recovery options. Cloud computing offers a level of safety and low-cost treatment. It allows healthcare providers to conduct voice and video appointments and better treatment through private data [4].

Edge Computing: Edge computing and IoT are ways to analyze data quickly in real time. Edge computing is a distributed computing framework. Edge computing is data efficiency, security, ethical integrity and reduced dependency on remote servers [4].

Internet of Medical Things (IoMT): The IoMT has been labeled "Smart Healthcare" for creating a digitized healthcare system, connecting medical resources and healthcare services. IoMT improves healthcare quality while reducing costs [4]. In the future, it is estimated that bringing the IoT into medicine will help in more substantial, healthier and easier patient care [4].

Virtual Reality and Neuropsychological Assessment

Veneziani, et al., indicated that fully immersive Virtual Reality (VR) has emerged as a promising tool in neuropsychology [5]. Its potential to overcome the limitations of traditional neuropsychological tests and its suitability for treating Executive Functions (EFs) within Activities of Daily Living (ADL) make it a significant area of research. Panoramix is a powerful tool for detecting early AD and MCI cognitive markers.

Applications in the Field of Dementia

Facial Dementia Screening

Aging is a comprehensive process affecting the entire body. Facial assessment of perceived age, which is how a person appears based on facial features, correlates with lifespan, telomere length, arteriosclerosis and osteoporosis [6].

Microbleed Detection: Object Detection

Microbleeds are commonly observed in cerebral amyloid angiopathy and it has been suggested that they are associated with AD. Additionally, microbleeds constitute a significant risk factor for dementia [6].

Chatbot: Natural language processing

IRIDE is developing a chatbot for emotional support for older people in collaboration with MindShift [4].

MemoryCareAI

MemoryCareAI is at the forefront of this transformation, a critical point for those underserved by healthcare systems. AI-driven cognitive health solutions in support of Alzheimer's and related dementias reach all. It is designed to meet HIPAA and GDPR compliance standards and safeguard user information. The platform has 30 speech and facial biomarker analyses, neuropsychological assessments, memory exercises, medication reminders and an emotionally intelligent digital human companion, Rachel, as per the founder of MemoryCareAI.

Conclusion

Strong evidence has been that a Mediterranean diet, high consumption of greens and reduced saturated fats and meat intake benefit your brain reserve. Lifestyle mitigates dementia and can maintain optimal brain function. There are symptomatic drugs, brain scans and anti-amyloid meds that have side effects. There are not enough doctors and advanced practitioners to take care of patients in the future. Algorithms can support healthcare professionals and patients' care. As these technologies progress, it is important to prioritize privacy, obtain informed consent, examine potential biases and reduce costs by \$251 billion by 2050. It is a supply and demand in expertise and AI has tremendous potential.

Conflict of Interests

The authors have no conflict of interest to declare related to this article.

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